

The polar bear *Ursus maritimus* feeding in a seabird colony in Frans Josef Land

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Stempniewicz, L. 1993: The polar bear *Ursus maritimus* feeding in a seabird colony in Frans Josef Land. *Polar Research* 12(1), 33–36.

During the second half of August 1992 polar bears were observed feeding intensively in the little auk *Alle alle* colony on Rubini Rock, Hooker Island, Frans Josef Land. They dug out nests eating eggs, chicks and adult birds. Their activity results in both worsening the breeding conditions and decreasing the breeding success of the little auks. The polar bear has not earlier been known as a little auk predator.

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Introduction

The polar bear *Ursus maritimus* is an opportunistic omnivore. It most often hunts for seals, mainly the ringed seal *Phoca hispida* and bearded seal *Erignathus barbatus* as well as the harp seal *Pagophilus groenlandicus* and hooded seal *Cystophora cristata*. Sporadically it attacks walrus (*Odoboenus rosmarus*), belugas (*Delphinapterus leucas*) and narwhals (*Monodon monoceros*). Polar bears also occasionally kill large terrestrial vertebrates, such as muskoxen (*Ovibos moschatus*), reindeer (*Rangifer tarandus*) and even domestic animals and humans (Larsen 1978; Smith 1980; 1985; Gjertz & Persen 1987; Uspensky 1989).

Moreover, polar bears are both scavengers, feeding on carrion and offal, and cannibals (especially adult males), attacking young, weak and ill specimens (Taylor et al. 1985). Their diet also consists of plants, both of marine (e.g. *Laminaria* spp.) and terrestrial origin (e.g. grasses, mosses, lichens, berries, *Salix* spp.). Food composition shows large seasonal and geographical differentiation due to local and temporal food availability. Some individuals can develop specialised foraging techniques (Larsen 1978; Uspensky 1989).

In some regions birds constitute a supplementary prey for polar bears during the summer. Ducks (*Somateria* spp., *Clangula hyemalis*) and geese (*Branta* spp., *Chen* spp.) nesting in high

density on flat islets and coastal tundra are relatively easy prey. The polar bears eat eggs, chicks and incubating parents as well as flightless, moulting individuals. Birds are not even safe on the water where polar bears swim quietly toward them, dive and catch them from underneath (Russet 1975; Larsen 1978).

Polar bears often visit Arctic islands which are populated with large seabird colonies. They penetrate the cliff foot searching for dead birds and for eggs and nestlings that have fallen from the nests. They also try to plunder lower situated nests of guillemots *Uria* spp. and kittiwakes *Rissa* spp. Polar bears can dig out burrow-nesting seabirds (e.g. puffins *Fratercula* spp.) and lemmings (*Lemmus* spp., *Dicrostonyx* spp.) (Larsen 1978; Brown 1988; Uspensky 1989).

Large gull species and particularly the glaucous gull *Larus hyperboreus* and Arctic fox *Alopex lagopus* belong to the most important little auk *Alle alle* predators. The Arctic skua *Stercorarius parasiticus* preys upon them sporadically (Stempniewicz 1981, 1983). No information was found in the available literature indicating that the polar bear is a little auk predator.

Study area

The study took place in the little auk colony on Rubini Rock, Hooker Island, Frans Josef Land (82°18'N, 52°37'E). My base was a hut located at

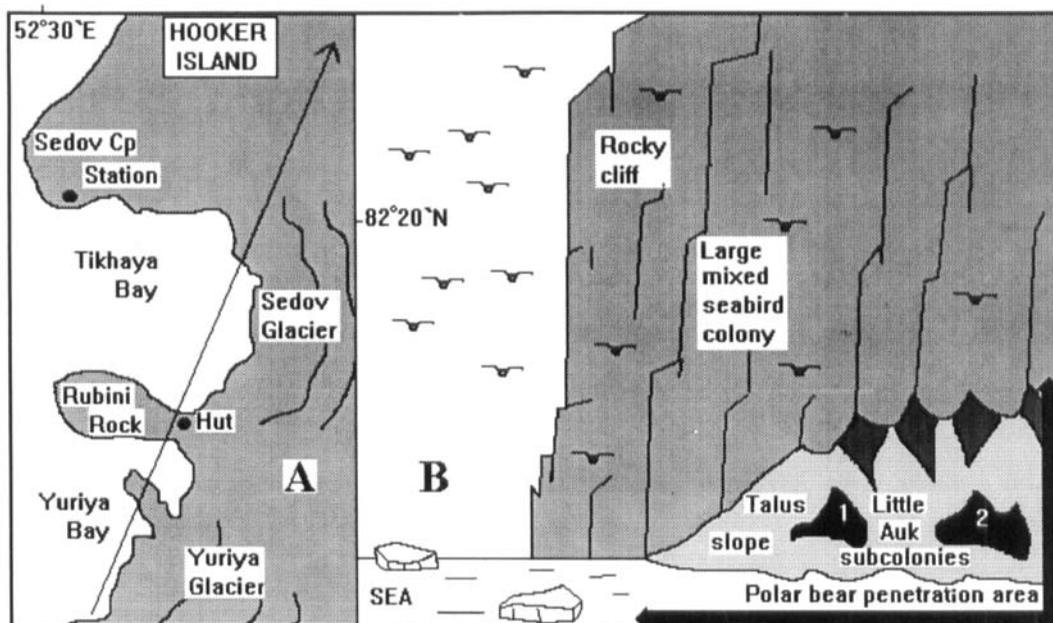


Fig. 1. Study area: A. Contour map; B. Sketch of the southern part of the Rubini Rock. The arrow on part A indicates a general direction of the polar bears in passing the study area.

the foot of Rubini Rock, several hundred metres from the colony (Fig. 1). The area apparently lies on the route of polar bear passage. The polar bears approached Rubini Rock from the southwest and left the area to the northeast, keeping more or less close to the coast. During the first 10 days of the study, 22 polar bears were observed in near vicinity. The large seabird breeding aggregation could be responsible, or at least partially responsible, for the presence of the polar bears.

Situated on a steep rocky cliff which drops directly to the sea, most of the colony is completely inaccessible for terrestrial predators, including man. Several thousands of Brunnich's guillemots *Uria lomvia*, kittiwakes *Rissa tridactyla* and little auks, as well as some hundreds of fulmars *Fulmarus glacialis* and black guillemots *Cephus grylle*, and a few glaucous gulls *Larus hyperboreus* breed there. Only from the southern side is Rubini Rock partly accessible. On the side of the cliff there is a talus slope inclined to about 45° and covered with rich vegetation (mainly *Alopecurus alpinus*, *Poa arctica*, *Ranunculus sulphureus* and *Cochlearia groenlandica*). Two little auk subcolonies are situated here in the rock debris (Fig. 1). Large numbers of little auks and

some black guillemots and fulmars breed on the steep wall above the talus slope.

Observations

In the period 15 August–5 September, polar bears were observed feeding on the southern (accessible) side of Rubini Rock. They penetrated both the foot of the cliff and the little auk subcolonies on the slope. At the base of the cliff they searched for dead birds and attempted to reach the lower little auk nests by standing on their hind limbs and pawing the rock fragments to uncover the nesting crevices. Only a small number of nests were situated low enough to fall within the range of polar bear paws, and most of the boulders were too large to overturn. Moreover, adult little auks could take flight and the chicks could squeeze into another crevice. The polar bears spent much time here looking for food, resting and sleeping. I found several shallow holes in the ground where the polar bears had denned. These were lined with hair and the vegetation had been removed. Excrements as well as extensively grazed grass were usually observed near the dens.

Polar bears feeding in the little auk subcolonies

on the talus slope used a different method. Approaching as a rule from below, a bear would choose a place with high nest density and begin overturning the boulders which covered the nests. Some of these often weighed several hundred kilos. Having uncovered a nest, the bear would then eat the eggs, chicks and adult birds. The chicks and adults which moved deeper into the rock debris were caught when the bear pawed into the next layer of rock debris. Finished with one area of the colony, the predator would climb several metres higher and begin again to dig in the rock debris. This behaviour was repeated until the bear reached the upper edge of the colony. During its search for food, the bear would rest for short periods, lying nearby on the grass. Consequently, the feeding bear left behind it a trail of craters in the little auk colony. These craters measured from 0.5 to 0.7 m deep and from 0.7 to 1.5 m in diameter, depending on boulder size and nest density.

Polar bears apparently visit the colony in successive years and during different stages of the little auk breeding period. The presence of fresh and old holes on the colony surface give evidence of this. Fresh craters are green because algae covers the boulders from the deeper layers of the rock debris. Old craters, like the rest of the colony surface, are free of vegetation because of the large amounts of little auk excreta deposited there. Remnants of egg shells, blood traces and nestling excrements usually could be found within the craters. As chicks defecate at one corner of the nest, the presence of such a depot makes it possible to consider the nest as being occupied (Stempniewicz 1990). Bear excrements however, numerous on the talus slope, consisted almost exclusively of whole, undigested wings of adult little auks. Though nestlings constitute also a considerable part of polar bear prey in the little auk colony, their remnants are difficult to recognize in the bear faeces. Most probably, this is because of a higher degree of assimilation of their tissues by bear alimentary tract. Polar bears could catch adult birds staying in the nest during different stages of the little auk breeding period due to egg incubation, chick brooding and feeding.

Discussion

Most of the little auk population nests on rocky cliffs in Frans Josef Land. This is a result of severe

climatic conditions, i.e. low temperatures and long lasting ice and snow cover laying (Gorbunov 1932; Demme 1934). Compared to talus slopes, the steep rocky walls are free of snow and ice earlier and for a longer time during the summer. Strong predatory pressure of the polar bears can also contribute to little auk breeding in such an inaccessible habitat. Only those little auks that are unable to take over a limited number of such safe nesting places will breed in talus (Stempniewicz 1981, in prep; Birkhead & Harris 1985).

As a result of polar bear activity in the little auk talus colony the talus surface becomes unstable. The movable boulders create an additional danger of crushing the little auk broods. Snow cover remains for a long time in the craters dug out by the polar bears, making them humid. As the thin layer of rock debris does not provide enough insulation from the permafrost, these places are no longer attractive to the little auks for breeding. No active nests were found in the old craters (28 craters examined) compared to mean nest density in the whole talus subcolony amounting to 0.25/m². The highest density observed did not exceed 2 nests per 1 m².

Polar bears choose rather central parts of the little auk colony which offer high nest density and ensure more efficient feeding. To dig a crater 0.6 m deep and 1 m in diameter in the rock debris, a bear must overturn boulders weighing several hundred kilos. At best it will find and plunder not more than two nests, i.e. 2 adult and 2 nestling birds weighing altogether about 0.5 kg. The search for food often yields less results because the bear may penetrate colony parts with lower nest density, meet boulders too large to move, or lose the prey which manages to escape. To cover its daily energy needs, estimated to be 8 kg of seal meat and blubber (Uspensky 1989), a bear would have to consume at least 32 adult and nestling little auks and dig 16 craters overturning several tonnes of rock debris. For these reasons the efficiency of polar bear feeding in the little auk colony, i.e. a relation of energy losses to gains, doesn't seem high. It is possible that this feeding method is used only by some specialised and experienced individuals which are able to detect dense patches of active nests covered with rock debris easy to remove, thus improving their hunting efficiency. Starving, inexperienced individuals may try to follow this food searching pattern especially when other sources of food are not available.

For the reasons mentioned above, peripheral parts of the colony are less endangered by the predators, in contrast to the general rules of predatory pressure exerted on colonial animals (Perrins & Birkhead 1983).

The mean little auk nest density in the Hornsund area (in a very similar habitat, but not visited by polar bears) amounts to 0.75/1 m² (Stempniewicz 1981). This is 3 times higher than that observed on Rubini Rock at the end of August. A large number of fresh (this year) craters observed in the central (most abundant) part of the Rubini Rock colony proves that nest density must have been considerably (about 2 times) higher at the beginning of the breeding season. Polar bear predatory pressure can be significant for the little auk breeding success, especially in regions where polar bears are numerous during the spring and summer and little auk colonies are located close to the coastal line in the rock debris in easily accessible locations such as Rubini Rock.

Acknowledgements. – Data presented in this paper were collected during the international expedition to Frans Josef Land (RUS-NOR-POL '92). Financial support was received from the University of Gdańsk (grant nr. BW/1140-5-00872). My friend Marcin Węśławski provided much appreciated help in the field. An anonymous referee gave valuable suggestions for improving the manuscript.

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